

Having thus described the invention, it is so claimed:

1. A wire gripping device for a welding wire feeder, said gripping device comprising:
a support member, a first pinch roll mounted on said support mounting, a lever arm pivotally
connected to said support member, and having a second pinch roll mounted thereon for pivotal
displacement therewith toward said first pinch roll to grip a wire therebetween, and an adjustable
spring device between said support member and said lever for biasing said second pinch roll toward
said first pinch roll to produce a gripping force on a wire therebetween, said spring device including
a first member, a second member displaceable toward and away from said first member, and a spring
mechanism between said first and second members, said spring mechanism having at least a first and
a second spring modulus for producing said gripping force as said first and second members are
displaced toward one another, said spring mechanism applying a first range of gripping forces with
the force produced by said first spring modulus and a second range of gripping forces with force
produced by said second spring modulus.
2. The gripping device of claim 1, wherein said spring mechanism includes at least a
first and a second spring.
3. The gripping device of claim 2, wherein said first and second springs are compression
springs, said first spring having a first spring height and said second spring having a second spring
height, said first and second spring heights being unequal.
4. The gripping device of claim 1, wherein said spring mechanism includes a spring
having at least two spring moduli.
5. The gripping device of claim 1, wherein said spring mechanism includes a plurality
of springs each having a uniform spring rate.

6. The gripping device of claim 1, wherein said spring mechanism includes a variable rate spring.

7. The gripping device of claim 1, wherein said spring mechanism includes a first and a second compression spring, said first spring having a first spring height and a first spring diameter, said second spring having a second spring height and a second spring diameter, said first and second spring heights being unequal, and said first and second spring diameters being unequal such that one of said first and second springs is positionable within the other.

8. The gripping device of claim 7, wherein said adjustable spring device further includes a post, said post being pivotably connected to said support member at a first end to allow pivotable movement of the post between a drive position and a released position, said post threadingly engaging said second member to enable said displacement thereof toward and away from said first member.

9. The gripping device of claim 8, wherein said first and second members are elongated members having a spring pocket for receiving said first and second springs, said spring pocket at least partially enclosing said first and second springs.

10. The gripping device of claim 8, wherein said first and second members are mounted on said post and said first and second springs are coaxial with said post.

11. The gripping device of claim 1, wherein said spring device further includes a cylinder post, said cylinder post being connected to said support member at a first end and threadingly engaging with said second member to enable said displacement of said second member toward and away from said first member.

12. The gripping device of claim 11, wherein said first end of said cylinder post is pivotably connected to said support member to allow pivotable movement of the post between a drive position and a released position.

13. The gripping device of claim 1, wherein said spring device further includes a cylinder post, said cylinder post being connected to said support member at a first end to allow pivotable movement of the post between a drive position and a released position, said post threadingly engaging with said second member to enable said displacement of said second member toward and away from said first member, said first member having an end wall facing said lever arm, one of said end surfaces and said support member including a locking ridge and the other of said end surface and said lever arm including a locking groove, said locking ridge engaging said locking groove to retain said spring device in said drive position.

14. The gripping device of claim 1, wherein said first and second members are elongated members having a spring pocket for receiving said first and second springs, said spring pocket at least partially enclosing said first and second springs, said first and second members including a first and a second side wall respectively with respective first and second outer surfaces, one of said first and second outer surfaces including adjustment graduations.

15. The gripping device of claim 1, wherein said adjustable spring device has a spring device axis and further includes a post coaxial with said axis, said post being pivotably connected to said support member at a first end to allow pivotable movement of the post between a drive position and a released position, said post threadingly engaging said second member to enable said displacement thereof toward and away from said first member, said first and second members being elongated members coaxial with said spring device axis and having a spring pocket for receiving said first and second springs, said spring pocket at least partially enclosing said first and second springs.

16. The gripping device of claim 15, wherein said first member further includes an end wall facing said lever arm with a through hole, said post extend through said hole.

17. The gripping device of claim 1, wherein said adjustable spring device further includes a post, said post being pivotably connected to said support member at a first end to allow pivotable movement of the post between a drive position and a released position, said post threadingly engaging said second member to enable said displacement thereof toward and away from said first member, said first and second member are elongated members having a spring pocket for receiving said first and second springs, said spring pocket at least partially enclosing said first and second springs, said second member further including a top with a thread extender extending downwardly from said top into said spring pocket.

18. The gripping device of claim 17, wherein said first member further includes a bottom, said spring device including at least one compression spring extending between said top and bottom within said spring pocket, a portion of said at least one spring extending about said thread extender.

19. The gripping device of claim 1, wherein said lever is pivotably connected to said support member at a first end and said spring device engages said lever arm at a second end, said second pinch roller being rotatably connected to said lever between said first and second ends.

20. A compression cylinder for a set of pinch rollers in a welding wire feeder wherein the wire passes between the pinch rollers which engage the wire with a gripping force, said cylinder comprising: a first member; a second member displaceable relative to said first member; and a spring mechanism extending between said first and second members having at least a first and a second spring modulus, said spring mechanism producing said gripping force as said first and second members are displaced relative to one another, said cylinder urging one roller of the set of pinch rollers toward the other to apply the gripping force, and said cylinder applying a first range of

gripping forces with force produced by said first spring modulus and a second range of gripping forces with force produced by said second spring modulus.

21. The gripping device of claim 20, wherein said spring mechanism includes at least a first and a second spring.

22. The gripping device of claim 21, wherein said first and second springs are compression springs, said first spring having a first spring height and said second spring having a second spring height, said first and second spring heights being unequal.

23. The gripping device of claim 20, wherein said spring mechanism includes a spring having at least two spring moduli.

24. The gripping device of claim 20, wherein said spring mechanism includes a variable rate spring.

25. The gripping device of claim 20, wherein said spring mechanism includes a first and a second compression spring, said first spring having a first spring height and a first spring diameter, said second spring having a second spring height and a second spring diameter, said first and second spring heights being unequal, and said first and second spring diameters being unequal such that one of said first and second springs is positionable within the other.

26. The gripping device of claim 20, wherein said adjustable spring device further includes a post, said post being pivotably connected to said support member at a first end to allow pivotable movement of the post between a drive position and a released position, said post threadingly engaging said second member to enable said displacement thereof toward and away from said first member.

27. The gripping device of claim 21, wherein said first and second members are elongated members having a spring pocket for receiving said first and second springs, said spring pocket at least partially enclosing said first and second springs.

28. The gripping device of claim 20, wherein said spring device further includes a cylinder post, said cylinder post being connected to said support member at a first end to allow pivotable movement of the post between a drive position and a released position, said post threadingly engaging with said second member to enable said displacement of said second member toward and away from said first member, said first member having an end wall facing said lever arm, one of said end surfaces and said support member including a locking ridge and the other of said end surface and said lever arm including a locking groove, said locking ridge engaging said locking groove to retain said spring device in said drive position.

29. The gripping device of claim 20, wherein said first and second members are elongated members having a spring pocket for receiving said first and second springs, said spring pocket at least partially enclosing said first and second springs, said first and second members including a first and a second side wall respectively with respective first and second outer surfaces, one of said first and second outer surfaces including adjustment graduations.

30. The gripping device of claim 20, wherein said adjustable spring device further includes a post, said post being pivotably connected to said support member at a first end to allow pivotable movement of the post between a drive position and a released position, said post threadingly engaging said second member to enable said displacement thereof toward and away from said first member, said first and second member are elongated members having a spring pocket for receiving said first and second springs, said spring pocket at least partially enclosing said first and second springs, said second member further including a top with a thread extender extending downwardly from said top into said spring pocket.